

What is claimed is:

1. A ball assembly comprising:
 - a housing having interior passage;
 - an annular seat extending into the interior passage at a first end of the housing;
 - a ball disposed in the housing and prevented by the seat from exiting the housing;
 - a conductive adapter coupled to a second end of the housing; and
 - a contact element electrically coupling the adapter and the ball.
2. The ball assembly of claim 1, wherein the ball has an outer surface comprised of a soft conductive material.
3. The ball assembly of claim 2, wherein the ball has a soft resilient core.
4. The ball assembly of claim 3, wherein the core at least partially comprises at least one material selected from the group consisting of elastic organic polymers, ethylene-propylene-diene (EDPM), poly-alkenes, polyalkynes, polyesters, poly-aromatic alkenes/alkynes, polyimide, polycarbonate, polyurethane, inorganic polymers, siloxane, polysilicon and polysilane.
5. The ball assembly of claim 1, wherein the ball is comprised of at least one of a conductive polymer or polymer having conductive material disposed therein.
6. The ball assembly of claim 1, wherein the ball is movable between a first position having at least a portion of the ball exposed beyond the first end of the housing and at least a second position flush with the first end of the housing, wherein the contact element maintains electrical contact with the ball between the first and second positions.

7. The ball assembly of claim 6, wherein the ball has at least one of a gold or copper exterior surface.
8. The ball assembly of claim 1, wherein the housing further comprises a drive feature disposed at the first end.
9. The ball assembly of claim 8, wherein the drive feature further comprises a hexagonal projection.
10. The ball assembly of claim 1, wherein the housing is fabricated from PEEK.
11. The ball assembly of claim 1, wherein the contact element further comprises:
an annular base; and
a plurality of flexures extending from the base to a distal end.
12. The ball assembly of claim 11, wherein the housing further comprises:
an annular groove formed in an interior wall of the housing for receiving the distal ends of the flexures.
13. The ball assembly of claim 11, wherein each of the flexures further comprises:
two members having first ends coupled to the base and extending therefrom to the distal end of the flexure;
a plurality of rungs coupling the members; and
a contact pad coupling the members at the distal end of the flexure.
14. The ball assembly of claim 11 further comprising:
a clamp bushing coupling the contact element to the adapter.
15. The ball assembly of claim 14, where the clamp bushing further comprises:
a head; and

a threaded post extending from the head and through the base of the contact element, the threaded post engaging a threaded portion of a passage formed at least partially through the adapter.

16. The ball assembly of claim 15, wherein the head includes a drive feature.

17. The ball assembly of claim 16, wherein the drive feature of the clamp bushing is a hex hole formed in at least a portion of a passage disposed through the clamp bushing.

18. The ball assembly of claim 11, wherein the contact member is gold-coated beryllium copper.

19. The ball assembly of claim 1, wherein the adapter further comprises:
a boss mating with the second end of the housing; and
a threaded post extending from the boss opposite the housing.

20. The ball assembly of claim 19, wherein the adapter further comprises a passage framed through the head and threaded post.

21. The ball assembly of claim 20, wherein the adapter further comprises a drive feature.

22. The ball assembly of claim 21, wherein the drive feature further comprises a hex hole framed in a portion of the passage disposed in the threaded post.

23. The ball assembly of claim 1, wherein the ball is hollow.

24. The ball assembly of claim 1 further comprising:
a polishing material having an upper surface adapted to process a substrate thereon;
a platen supporting the polishing material; and

a conductive contact plate disposed in the platen having a hole receiving a portion of the conductive adapter.

25. A ball assembly comprising:

a conductive adapter having a threaded post coupled to a boss, the adapter having a passage formed through the boss and post;

a hollow cylindrical dielectric housing having a first end having an annular seat extending radially inward and a second end engaging the boss of the adapter;

a conductive contact member having a plurality of flexures extending from an annular base;

a clamp bushing having a threaded post extending from a flared head, the threaded post of the contact member extending through the base and engaging a threaded portion of the passage disposed through the adapter and urging the head toward the adapted, clamping the base between the head of the clamp bushing and the boss of the adapter; and

a conductive ball disposed in the housing and movable between a first position having a portion of the ball extending through the seat and at least a second position flush with the first end of the housing, wherein the flexures maintain electrical contact with the ball in the first and second positions.

26. The ball assembly of claim 25, wherein the flared head orientates the flexures at an acute angle relative to a center line of the ball assembly.

27. The ball assembly of claim 25, wherein the housing further comprises a drive feature disposed at the first end.

28. The ball assembly of claim 27, wherein the drive feature is a hex head.

29. The ball assembly of claim 25, wherein the contact member has a gold exterior and the ball has at least one of a gold or copper exterior.

30. The ball assembly of claim 29, wherein the adapter is stainless steel.

31. The ball assembly of claim 25, wherein the ball is hollow.

32. A ball assembly comprising:

a conductive adapter having a threaded post coupled to a boss, the adapter having an aperture formed through the boss and post;

a hollow cylindrical dielectric housing having a first end and a second end engaging the boss of the adapter;

a conductive ball disposed in the housing and having a diameter that allows fluid flow passage to be defined through the housing, around the ball and through the aperture, the ball movable between a first position having a portion of the ball extending through the first end and at least a second position flush with the first end of the housing; and

a connection means for maintaining electrical connection between the ball and the adapter when the ball is in the first and second positions.

33. The ball assembly of claim 32, wherein the connection means further comprises:

a spring form, a compression spring or a conductive bearing.

34. The ball assembly of claim 32, wherein the connection means further comprises:

a conductive contact member having a plurality of flexures extended from an annular base that are adapted to contact the ball.

35. The ball assembly of claim 34 further comprising:

a clamp bushing having a threaded post extending from a flared head, the threaded post of the contact member extending through the base and engaging a threaded portion of the aperture disposed through the adapter and urging the head toward the adapted, clamping the base between the head of the clamp bushing and the boss of the adapter.

36. The ball assembly of claim 35, wherein the clamp bushing further comprises:
a passage extending therethrough; and
a hex drive feature formed in a portion of the passage opposite the threaded post of the clamp bushing.
37. The ball assembly of claim 36, wherein the aperture of the conductive adapter further comprises:
a hex drive feature formed in a portion of the aperture opposite the threaded portion of the aperture.
38. The ball assembly of claim 34, wherein the housing further comprises:
an annular groove formed in an interior wall of the housing for receiving the distal ends of the flexures.
39. The ball assembly of claim 34, wherein at least one of the flexures further comprises:
at least one aperture formed therethrough.
40. The ball assembly of claim 32, wherein the housing further comprises:
a hex drive feature formed at the first end.
41. A ball assembly comprising:
a first plate;
a second plate coupled to the first plate;
a plurality of apertures having portions formed through the first and second plates;
a plurality of conductive balls, one of the balls respectively disposed in a respective one of the apertures, each ball movable between a first position having a portion of the ball extending through an outer surface of the first plate and at least a second position flush with the outer surface of the first plate; and
a plurality of conductive contact members electrically coupling the conductive balls to the second plate.

42. The ball assembly of claim 41, wherein the first plate is fabricated from a dielectric material.
43. The ball assembly of claim 41, wherein the second plate is fabricated from a conductive material.
44. The ball assembly of claim 41, wherein the first plate further comprises:
a plurality of an annular seats each extending radially into a respective one of the apertures.
45. The ball assembly of claim 41, wherein at least one of the conductive contact members further comprises:
an annular base; and
a plurality of flexures extending from an annular base and contacting one of the balls.
46. The ball assembly of claim 45 further comprising:
a clamp bushing coupling the base to the second plate.
47. The ball assembly of claim 46, wherein the clamp bushing further comprises:
a flared head; and
a threaded post extending from a flared head and passing through the base of the contact member, the post engaging a threaded portion of the aperture disposed in the second plate.
48. The ball assembly of claim 46, wherein the clamp bushing further comprises:
a passage formed axially therethrough.
49. The ball assembly of claim 41, wherein at least one of the balls has an outer surface comprised of a soft conductive material.

50. The ball assembly of claim 41, wherein at least one of the balls has a soft resilient core.

51. The ball assembly of claim 50, wherein the core at least partially comprises at least one material selected from the group consisting of elastic organic polymers, ethylene-propylene-diene (EDPM), poly-alkenes, polyalkynes, polyesters, poly-aromatic alkenes/alkynes, polyimide, polycarbonate, polyurethane, inorganic polymers, siloxane, polysilicon and polysilane.

52. The ball assembly of claim 41, wherein the ball is comprised of a conductive polymer.

53. The ball assembly of claim 41, wherein the ball is hollow.

54. The ball assembly of claim 41, wherein the ball has at least one of a gold or copper exterior.

55. The ball assembly of claim 41 further comprising:
a platen having the second plate coupled thereto; and
a polishing material disposed on the platen and having a passage formed therethrough, the passages having at least the first plate disposed therein.

56. A system for electrochemically processing a substrate, comprising:
a platen,
a polishing material;
an electrode coupled to the polishing material and disposed on the platen;
a ball assembly coupled to the platen and extending through the polishing material; and
a power source having a first terminal coupled to the electrode and a second terminal coupled to the ball assembly.

57. The system of claim 56, wherein the system further comprises:
- a housing having interior passage;
 - an annular seat extending into the interior passage at a first end of the housing;
 - a ball disposed in the housing and prevented by the seat from exiting the housing;
 - a conductive adapter having a first end coupled to a second end of the housing and a second end coupled to the power source through the platen; and
 - a contact element electrically coupling the adapter and the ball.
58. The system of claim 56, wherein the system further comprises:
- a first plate;
 - a second plate coupled to the first plate, the power source and to the platen;
 - a plurality of apertures having portions formed through the first and second plates;
 - a plurality of conductive balls, one of the balls respectively disposed in a respective one of the apertures, each ball movable between a first position having a portion of the ball extending through an outer surface of the first plate and at least a second position flush with the outer surface of the first plate; and
 - a plurality of conductive contact members electrically coupling the conductive balls to the second plate.